



Intel® 845 Chipset Memory Controller Hub (MCH) Compact Thermal Model

User Guide

November 2001

Document Number: 298637-001



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Revision History

Rev.	Description	Date
-001	• Initial Release	November 2001



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1. Introduction

This document describes how to use the preliminary compact thermal model of the Intel® 845 Chipset. The thermal models are to be used by the commercially available Computational Fluid Dynamics (CFD)-based thermal analysis tool “FLOTHERM*” by Flomerics Inc*. The compact model and associated user guide are provided by Intel to aid OEM system designers in simulating, analyzing and optimizing their thermal solutions in an integrated system-level environment.

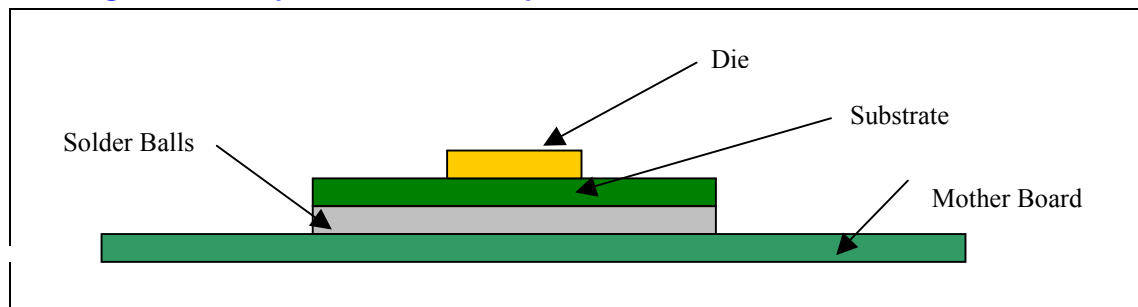
2. Construction of Intel® 845 Chipset Compact Thermal Models

Intel® 845 Chipset MCH is modeled as a simplified detailed model.

- Substrate details are removed
- Substrate and solder balls are modeled as orthotropic conducting cuboids

The result from these models can be off by up to $\pm 10\%$ depending on the OEM thermal solution.

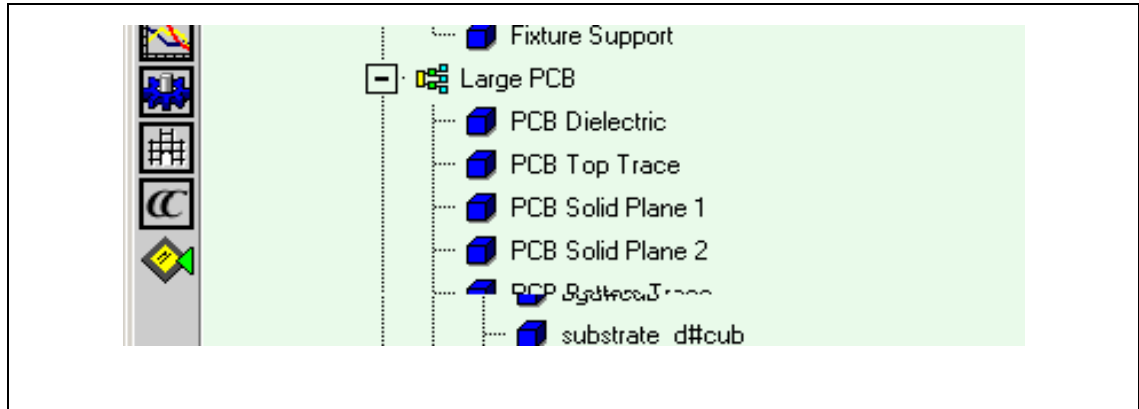
Figure 1: Showing critical components of the Compact model



The overall model is built using hierarchical approach comprising the following:

1. One cuboid with orthotropic conductivity representing solder balls.
2. One cuboid with orthotropic conductivity representing GMCH substrate.
3. A collapsed cuboid representing Die Attach and one cuboid representing silicon die.
4. A die heat source to tune simulated power.
5. And many monitoring points and regions to analyze temperatures and heat flow at various locations.

Figure 2: The hierarchical Flotherm* thermal model building approach



3. *Integrating the Intel® 845 Chipset MCH Models In A System–Level Model*

When integrating the Intel® 845 Chipset MCH model into a system-level thermal model, two major modeling issues must be considered:

1. Mating the model with the motherboard of a system model and
2. Attaching the OEM system thermal solution to cool the specific component.

3.1. **Connection with Mother Board (PC Board)**

The compact models are connected to the motherboard or other PCBs by attaching the “BGA Cuboid”. Users are advised to make perfect modeling contact between “BGA Cuboid” and the system motherboard cuboid.

3.2. **Attaching the OEM System Thermal Enhancement**

If a thermal enhancement is required, it must include a plate or other flat component that mates directly with the die through an appropriate thermal interface material. Make sure that the cuboid representing the thermal interface material has the appropriate properties that will provide the correct thermal resistance through this interface.

4. Model Grid

Make sure you have enough grid cells within and surrounding the compact model to reduce sharp thermal gradients. A minimum of 6 cells along the thickness and 10 cells along length and width are recommended.

5. Thermal Design Power Values

Intel® 845 Chipset MCH model is released with a default power of 0 W. Please refer to the “Intel® 845 Chipset Thermal Mechanical Design Guidelines” for component thermal design power (TDP) values. Then set TDP by changing the total power for “junction heat” source.

6. Thermal Design Specification

The Intel® 845 Chipset MCH measured die temperature should not exceed the die temperature target listed in “Intel® 845 Chipset Thermal Mechanical Design Guidelines”.

7. Technical Support

Users are advised to contact Flomerics Inc* (www.flomerics.com) Support offices worldwide for all software technical queries. All queries and questions regarding the model construction or Intel packaging information should be addressed to the local Intel Sales offices.